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Net-to-Gross Research Results for the ComEd Custom Program CY2018

EXECUTIVE SUMMARY

This memo presents the findings of the CY2018 net-to-gross (NTG) study of the ComEd Custom Program. The CY2018 NTG calculations were based on the NTG algorithms specified in the Illinois Technical Reference Manual (TRM) version 7.0 and rely on the self-report approach for estimating free ridership and spillover. Findings are based on in-depth interviews completed for 17 projects (out of a population of 123 projects) that represent 53% of program savings.¹

As shown in Table 1 below, the Private Sector mean energy NTG ratio averaged 0.70, while the Public Sector-DCEO² value averaged 0.24. The specific reasons behind the much lower Public Sector-DCEO value are discussed below.

These results will inform Navigant's September 2019 recommendations to the Illinois Stakeholders Advisory Group (SAG) of NTG values to be used for this program in CY2020.

Table 1. NTG Research Results for ComEd Custom Program CY2018

Overall Program	Savings Type	Free Ridership	Participant Spillover	NTG ratio
Private Sector				
All Measures	kWh	0.30	0.00	0.70
All Measures	kW	0.37	0.00	0.63
Public Sector - DCEO				
All Measures	kWh	0.76	0.00	0.24
All Measures	kW	0.77	0.00	0.23

Source: Evaluation team analysis

Public Sector projects exhibited particularly high free ridership and low NTG ratios. Note that all of these were legacy projects that had originated with DCEO and were passed over to ComEd at the time they took over the Public Sector programs as a result of the Illinois Future Energy Jobs Act legislation. Since taking these over, ComEd has also developed its own Public Sector projects. However, in CY2018, these projects were very small and thus, none were included in the Public Sector project sample. Therefore, the Private Sector NTG value will be applied to these ComEd Public Sector projects.

- The evaluation team interviewed five Public Sector projects, all legacy DCEO projects for water-wastewater treatment plants. Three of the largest projects were completed by the same organization at different locations, were for the same or similar measures, and resulted from a single decision. These projects had a NTG ratio of 0.20 and already had favorable project

¹ A total of 18 interviews was completed, however one project was found to have participated in the Standard program and was removed.

² All of the evaluated Public Sector projects were legacy DCEO water-wastewater projects.

economics that met internal requirements even without program incentives. The decisionmaker indicated that the rebate did not play a key role in moving their project economics within their acceptable payback range and that other program factors were not important in their decision making.

- Another smaller project, with a NTG ratio of 0.48, indicated that the program incentive was important but that other non-program factors such as reliability were even more important.
- The other project had a NTG ratio of 0.47 and involved replacement of aging equipment. The decisionmaker indicated that if the program had not been available, they still would have installed the same energy efficient equipment within one year of when they implemented it through the program.

In general, key contextual factors for projects with high free ridership included the following:

- The largest projects were motivated by non-energy influences and already had favorable payback periods that met internal requirements even without program incentives.
- Among medium-sized projects, some decisions were largely dictated by their standard corporate policies or practices. Others involved the urgent need to replace old equipment,
- For the smallest projects, many projects were largely driven by non-energy factors, such as their previous experience with the type of energy efficient equipment that they installed through the program, industry standard practice, or corporate policy or guidelines.

Because the evaluation sample excluded Public Sector-Non DCEO projects, just two sets of values are available from the evaluation, Private Sector, and Public Sector- DCEO. The CY2018 NTG ratio for Private Sector projects is 0.70, while the NTG ratio for Public Sector-DCEO projects is 0.24. Given the lack of evaluated Public Sector-Non DCEO projects, it is reasonable to assign the Private Sector NTG ratio until additional research can be done during the CY2019 evaluation. *The EM&V team recommends that the CY2018 NTG ratio values for Private Sector of 0.70, Public Sector-Non DCEO of 0.70 and Public Sector-DCEO of 0.24 be used to compute program-verified savings for CY2020 projects going forward.*

FREE RIDERSHIP AND SPILLOVER SURVEY DISPOSITION

In-depth telephone interviews were conducted with key decisionmakers for each sampled project. A total of 18 interviews was completed (13 Private Sector and 5 Public Sector). The survey interview guides followed the standard NTG question structure, but the in-depth format allowed for more flexibility for follow-up probing and consistency checking. Table 2 and Table 3 below report survey dispositions for free ridership and spillover question batteries, respectively.

Table 2. Free Ridership Decision Maker Survey Disposition

Measure	Population	Sample	Target Completes	Actual Completes	Analyzed Completes	Share of Program Savings Represented by Analyzed Completes
Private Sector	111	15	15	13	12	23%
Public Sector - DCEO	12	5	5	5	5	30%
Overall Program	123	20	20	18	17	53%

Source: Evaluation team analysis

Table 3. Participant Spillover Survey Disposition

Measure	Population	Sample	Target Completes	Actual Completes	Made Additional Efficiency Improvements	Qualified for Spillover
Private Sector	111	15	15	13	1	0
Public Sector - DCEO	12	5	5	5	0	0
Overall Program	123	20	20	18	1	0

Source: Evaluation team analysis

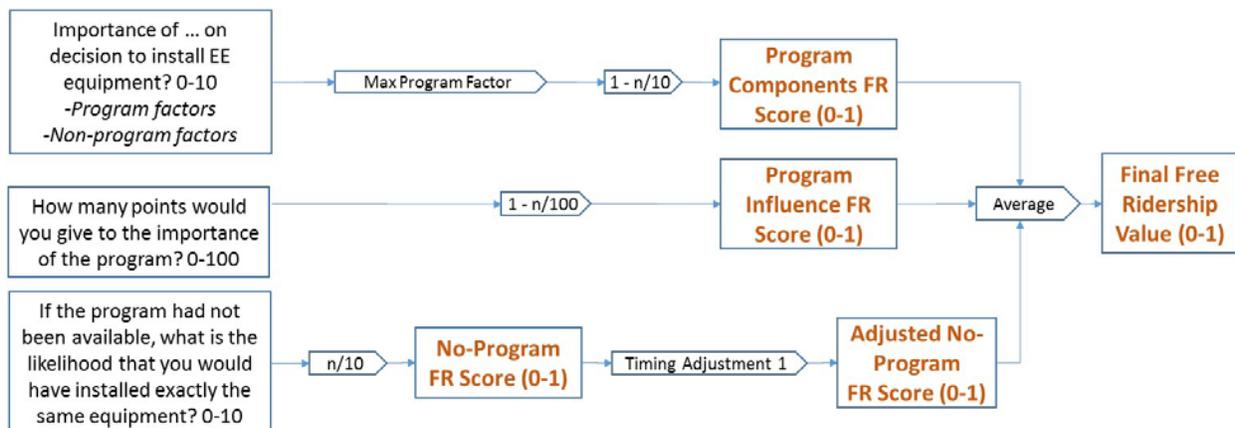
FREE RIDERSHIP AND SPILLOVER PROTOCOLS

The evaluation team applied the relevant free ridership and spillover protocols from the TRM. The NTG protocols in version 7.0 of the TRM were developed by the Illinois NTG Working Group in their deliberations during the summer and fall of 2018. For free ridership, the protocols provide two options for combining three sub-scores. These two options use different specifications to account for the impact that the program had on project timing (referred to as “deferred free ridership”). Evaluators are to calculate free ridership using both options and to select one option for purposes of calculating the net energy savings for comparing to the legislated goal.

The evaluation team’s preferred algorithm specification is **Core Free Ridership Algorithm 1**, shown graphically below (Figure 1). The majority of NTG findings discussed below are based on this version. The second option, Core Free Ridership Algorithm 2 (Figure 2) has also been analyzed, and those findings are presented as a sensitivity case later in this memo. The rationale for selecting Algorithm 1 over Algorithm 2 is that Algorithm 1 provides for equal weighting of each of the three sub-scores, which represent different ways of determining program influence. In contrast, Algorithm 2 applies a 50% weight to the program’s effect on the timing of the project, which we believe is too high. Such a high weighting essentially discounts the effect of the other factors that drive program influence, which in our view is inappropriate.

Figure 1. Core Free Ridership Algorithm 1

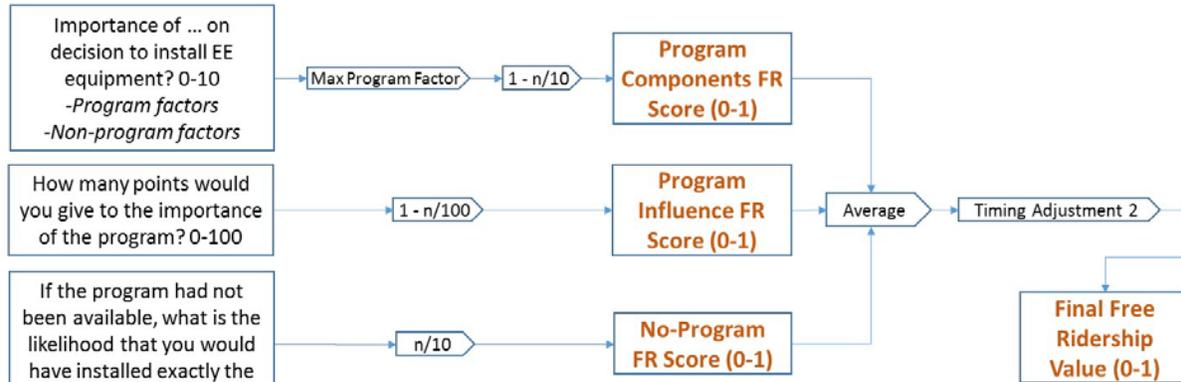
$$\frac{(\text{Program Components FR Score} + \text{Program Influence FR Score} + (\text{No-Program FR Score} * \text{Timing Adjustment 1}))}{3}$$



Source: Illinois TRM, version 7.0

Figure 2: Core Free Ridership Algorithm 2

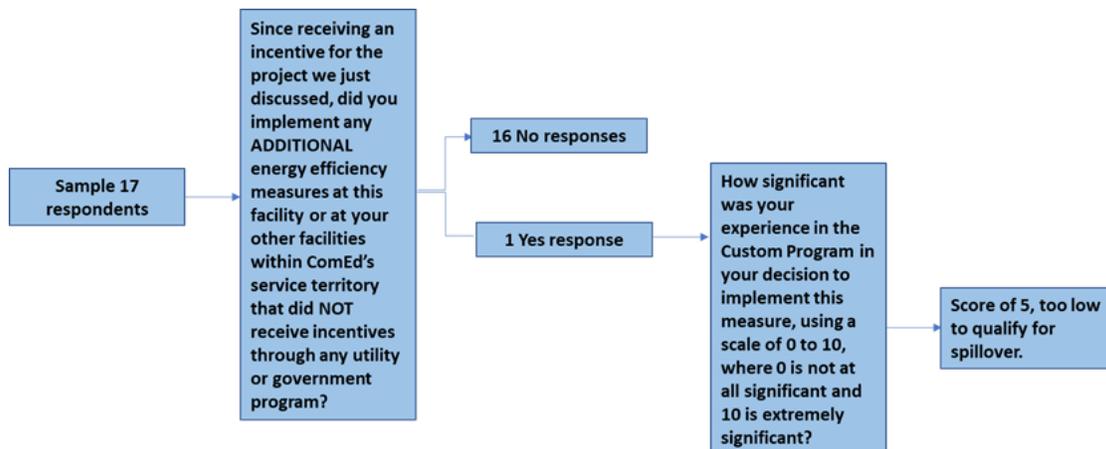
$$\left(\text{Program Components FR Score} + \text{Program Influence FR Score} + \text{No-Program FR Score} \right) / 3 * \text{Timing Adjustment 2}$$



Source: Illinois TRM, version 7.0

The Core Participant Spillover protocol specified in the TRM is the method that the evaluation team used to qualify non-rebated energy efficiency improvements to be spillover. This protocol is generally applicable to most commercial, industrial, and public sector programs. None of the surveyed projects reported improvements that qualified as spillover. Figure 3 below illustrates the Spillover qualification screening process that was used and the resulting lack of projects with qualified spillover.

Figure 3. Qualified Spillover



Source: Evaluation team analysis

DETAILED NTG RESULTS

Free Ridership Consistency Check Analysis

None of the interviews completed was excluded from the analysis because of inconsistencies or non-response. However, there were two types of exclusions or adjustments made, as reported below in Table 4:

- One large project with a completed interview was eliminated from both the gross and net samples and analyses because it was processed through the Standard program rather than the Custom program.
- In addition, as a result of the evaluation team's Quality Control review, two of the 17 projects were found to have No Program Responses and an associated No Program score that were inconsistent with the Program Components score.

- For **Project 1**, some of the explanation for their scoring of specific program-related factors was unrelated to the actual project decision making. According to the decisionmaker, if the program had not been available, they would have installed the exact same measures even without ComEd incentives. However, this answer was not fully consistent with other information they gave. For example, the ComEd account rep was scored a nine out of 10 in importance, and the explanation was, "we have a good relationship with our ComEd Account guy".

The customer had also scored the vendor highly as a decision influencer, and a second interview was completed with the vendor. They revealed that the rebate was not that important to the customer and the timeclocks and sensors would have been installed without it. They scored the rebate's importance a 2 out of 10 in importance, while they had rated the rebate an 8 of 10. In the remainder of the interview, the customer indicated that their parent company initiated the drive to lower their carbon footprint, so the project would have happened regardless of the incentive and they would have completed it on their own if the program had not been available. For these reasons, the Program Components score was dropped from the calculation of the NTG ratio.

- **Project 2** had similar inconsistencies between the Program Components responses and the No Program answers. The customer's facility had an incident that required them to replace their lighting equipment. To the No Program questions, the decisionmaker responded that if the program had not been available, they would have installed the exact same measures even without ComEd incentives. But their scoring of the Program Components was inconsistent with this response. The account representative and program representative received moderate to high scores, but elsewhere in the survey, the decisionmaker provided no explanation of either the account rep or the program staff's role, revealing that they weren't very important. They said the contractor was important and the incentive was not that important ["Any money back is awesome."]. In a follow-up interview with the vendor for the project, they indicated that the customer would have installed the same LED lighting even if program incentives had not been available. The project was very large, the rebate was relatively small, and the vendor said the program rebate had "zero impact". For these reasons, the Program Components score was dropped from the calculation of the NTG ratio.

Table 4. Free Ridership Consistency Check Disposition

Project-Level Response Disposition	All projects
Projects covered by interviews	18
Excluded: Ineligible project	1
Excluded: Non-response	0
Excluded: Triggered and Failed Consistency Check	2
Total of Excluded Responses	1
Analyzed Sample	17
Evaluated to Require no Exclusion	15
Evaluated to Exclude NP Score	0
Evaluated to Exclude PC Score	2

NP = No Program; PC = Program Components
Source: Evaluation team analysis

Free Ridership Component Scores

Table 5 below summarizes the average sub-scores and associated free ridership for each segment analyzed.

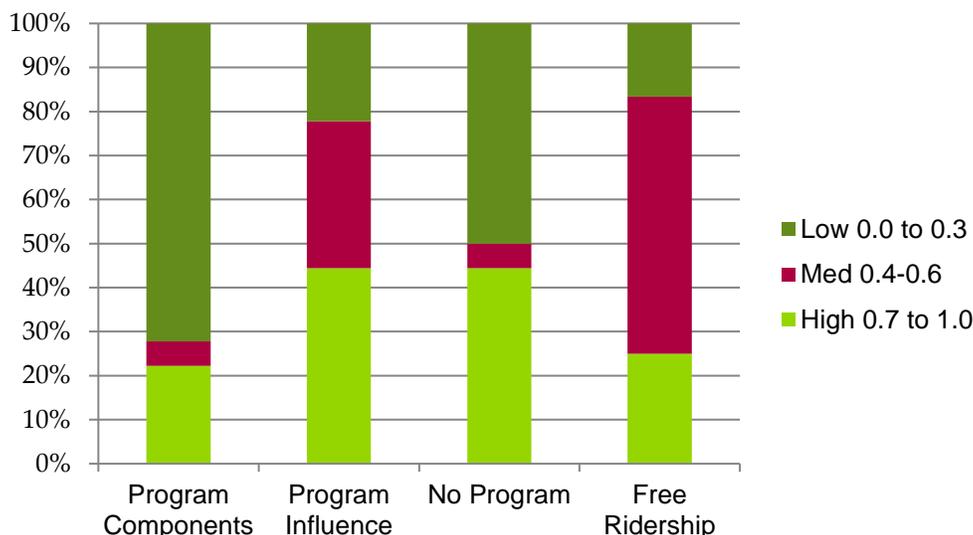
Table 5. Free Ridership Sub-Scores

Savings Type	Program Influence Score	Program Component Score	No Program Score	Free Ridership
Private Sector (kWh)	0.41	0.28	0.24	0.30
Public Sector - DCEO (kWh)	0.78	0.74	0.80	0.76

Source: Evaluation team analysis

A breakdown of the NTG ratio by the three sub-scores is shown graphically in Figure 4. The Program Components score reflects the importance of various program-related elements in the customer's decision and timing of the decision in selecting specific program measures. The Program Influence score reflects the relative degree of influence the program had on the customer's decision to install the specified measures versus non-program factors. The No Program score captures the likelihood of various actions the customer might have taken at this time and in the future if the program had not been available. Here, for all three sub-scores, a low score indicates low free ridership.

Figure 4: Free Ridership Level by Sub-Scores



Source: Evaluation team analysis

Note that the concentration of low values is significantly higher for the Program Components score than for either the Program Influence Score or the No Program score. As a result, Program Components score values tend to be lower than those for the other two scores. A key reason for this is that the Program Components score is based on the maximum importance rating provided to any given program element.

Sensitivity Case - Weighted NTG Results Based on Core Free Ridership Algorithm 2

The evaluation team also performed a sensitivity analysis based on Core Free Ridership Algorithm 2. NTG results are moderately higher than Algorithm 1 results due to the greater weight given to the acceleration (i.e. timing) effect of the program. Algorithm 2 varies from Algorithm 1 in the way it treats the effect of timing in the calculation of the free ridership value. Algorithm 1 adjusts for timing only on the No-Program score then averages the three sub-scores. Algorithm 2 determines the No-Program Score without a Timing adjustment, averages the three sub-scores, then applies a Timing adjustment factor to the three sub-score average, based on the formula below:

Timing Adjustment Factor (Free Ridership Score) as equal to:

$$1 - ((\text{Number of Months Expedited} - 6)/42) * ((10 - \text{Likelihood of Implementing within One Year})/10)$$

While not intuitive, this formula is designed to apply a linear adjustment factor to self-reported deferral (i.e., program induced acceleration) periods ranging from six months to 48 months. Thus, under this formula, a value of six months or less receives zero credit, and a value of 48 months or greater of accelerated adoption receives 100% credit. Both timing adjustment factors have the effect of only ever decreasing free ridership.

NTG Algorithm 2 –CY2018 Weighted NTG Results

Table 6 below summarizes the NTG research results for version 2 of the free ridership algorithm.

Table 6. NTG Research Results for CY2018 ComEd Custom Program – Free Ridership Algorithm 2

Overall Program	Savings Type	Free Ridership	Participant Spillover	NTG Ratio
Private Sector				
All Measures	kWh	0.19	0.00	0.81
All Measures	kW	0.18	0.00	0.82
Public Sector - DCEO				
All Measures	kWh	0.77	0.00	0.23
All Measures	kW	0.77	0.00	0.23

Source: Evaluation team analysis

The CY2018 program-level NTG ratios by sampling stratum for version 2 of the algorithm, along with precision estimates, are shown below in Table 7. The overall program NTG for CY2018 is 0.47, which is moderately higher than the Algorithm 1 value of 0.44. This timing “bump” is due to reports by several decisionmakers reported that the program accelerated the installation of their installed project compared to if there had been no program and incentive.

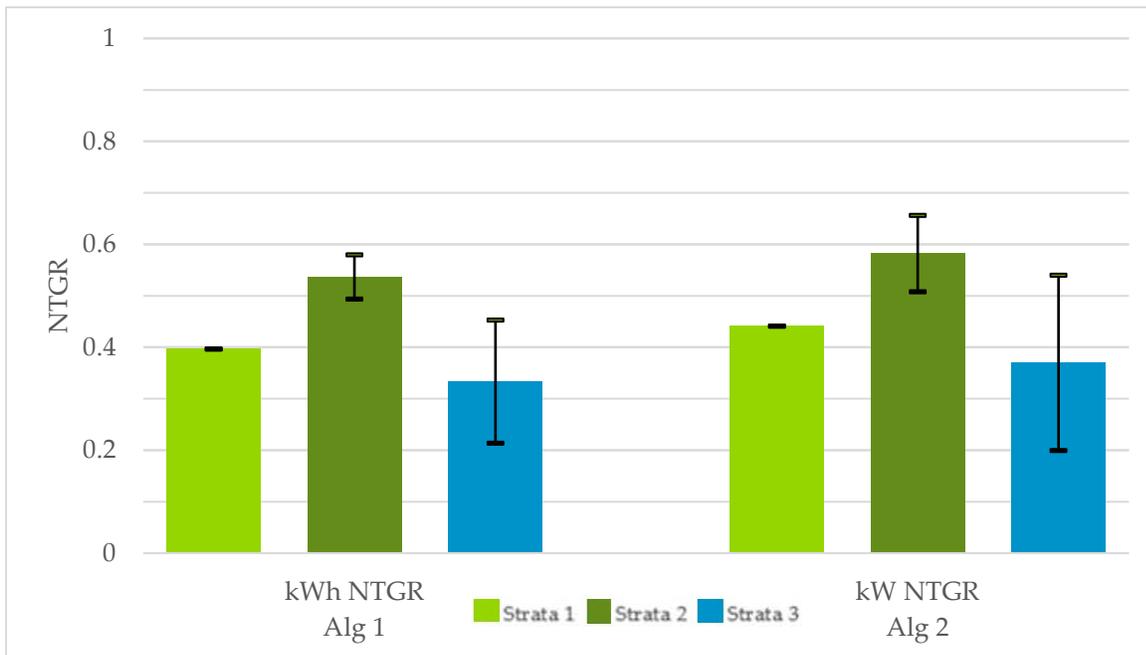
Table 7: Algorithm 2 CY2018 kWh NTG Ratio and Relative Precision at 90% Confidence Level

Sampling Strata	Number of Projects	Relative Precision ± %	Low	Mean	High
1	4	0%	0.44	0.44	0.44
2	7	13%	0.51	0.58	0.66
3	6	46%	0.20	0.37	0.54
Custom CY2018 Alg 2	17	13%	0.41	0.47	0.53

Source: Evaluation team analysis

Figure 5 below compares the evaluated NTG ratios for Algorithms 1 and 2 for each sampling stratum. For CY2018 when compared to Algorithm 1, the mean energy NTG ratio values are 0.44 (Algorithm 2) vs. 0.40 (Algorithm 1) for stratum 1 (large sized projects), 0.58 (Algorithm 2) vs. 0.54 (Algorithm 1) for stratum 2 (medium sized projects), and 0.37 (Algorithm 2) vs. 0.38 (Algorithm 1) for stratum 3 (small sized projects). The higher results across all three size strata drive the increase in the average program NTG ratio for Algorithm 2 relative to Algorithm 1.

Figure 5: Comparison of CY2018 Evaluated NTG ratio by NTG Algorithm and Stratum



Source: Evaluation team analysis

Spillover Estimation

As previously stated, none of the evaluated projects reported any non-rebated energy efficiency improvements that were sufficiently influenced by the program, thus the spillover savings is zero and the rate of spillover incorporated into the NTG ratios is zero.

Combining Free Ridership and Spillover to Create Program NTG Ratio

Estimates of free ridership and spillover were added together, and the resulting value was subtracted from unity (1.0) to yield the NTG ratio for each program segment, as reported in Table 8.

Table 8. Free Ridership and Participant Spillover for the Custom Program

Program Segment	Metric	Free Ridership	Participant Spillover	NTG
Private Sector	kWh	0.30	0.00	0.70
Public Sector - DCEO	kWh	0.76	0.00	0.24

Source: Evaluation team analysis

Procedures to Reduce Free Ridership

Without a doubt, the large non-residential market is perhaps the most challenging to address in terms of the size and sophistication of end-use customers and suppliers and the complexity of end-user projects. As a result, a certain amount of free ridership is to be expected in this market. Despite these challenges,

there are several different strategies available to ComEd to adjust program design elements and implementation procedures to reduce free ridership. These recommendations are as follows:

Recommendation: Adopt procedures to limit or exclude known free riders.

The best way to accomplish this is to conduct screening for high free ridership on a project-by-project basis. In cases where it is found, the program implementer should continue and expand their current pre-approval process to provide more explicit consideration and re-formulation of projects already planned for completion by the customer. The NTG ratios for the Custom Program had fluctuated between 0.56 and 0.72 since the program began until PY9 when the NTG ratio value declined significantly to 0.45. The current NTG ratio of 0.44 suggests a continuation of this downward trend. These recent declines in the PY9 and CY2018 NTG ratios suggest that a more aggressive approach is warranted, since the NTG ratios indicate significant free ridership is present.

Recommendation: Adjust the incentive formula.

Another path is for the program to set the standard for incentive eligibility higher across-the-board so that all such projects will need to meet a higher standard to qualify.

Note that **neither** of these options equates to rejecting a customer for energy efficiency funding. Instead, the concept is to “upsell” the customer to an energy efficiency project that they weren’t already planning to do on their own.

Screening out Free Riders

One way to assess the rate of free ridership likely on a given project is to critically examine the key reasons behind the project **before** the incentive is approved. For example:

- Has the project already been included in the capital or operating budget? Has the equipment already been ordered or installed?
- Is the measure one that the company or other comparable companies in the same industry or segment routinely installs as a standard practice? Is the measure installed in other locations, without co-funding by incentives? Is the measure potentially Industry Standard Practice?
- Is the project being done, in part, to comply with regulatory mandates (such as environmental regulations)?
- Are the project economics already compelling without incentives? Is the rebate large enough to make a difference in whether the project is implemented?
- Is the company in a market segment that is ahead of the curve on energy efficiency technology installations? Is it part of a national chain that already has a corporate policy to install the proposed technology?
- Does the proposed measure have substantial non-energy impacts? Is it largely being considered for non-energy reasons (such as improved quality or increased production)?
- Is the project payback quite short even without the incentive?

By conducting a brief interview regarding these issues before the incentive is approved, ComEd can better assess the likely degree of free ridership and may be able to then decide if the project should be excluded or substantially re-scoped to a higher efficiency level.

Cronbach's Alpha Results

Cronbach's Alpha is a measure of internal consistency or reliability. It is used to assess how closely related a set of items are as a group. In this memo, Cronbach's Alpha is used to assess how closely related the items going into the NTG score are to each other. In general, the higher the measured Cronbach's Alpha value, the more consistent and reliable are the results. However, given the small number of items (i.e., the three sub-scores) being considered in this application of Cronbach's Alpha, a high alpha value is not expected. Realistically, Alpha values ranging from 0.4 to 0.6 are considered an acceptable measure of reliability for this analysis given the small number of items being analyzed.

We used the Standardized Cronbach's Alpha calculation as specified below:

$$\alpha = \frac{N \cdot \bar{r}}{1 + (N - 1) \cdot \bar{r}}$$

Where:

N = the number of items

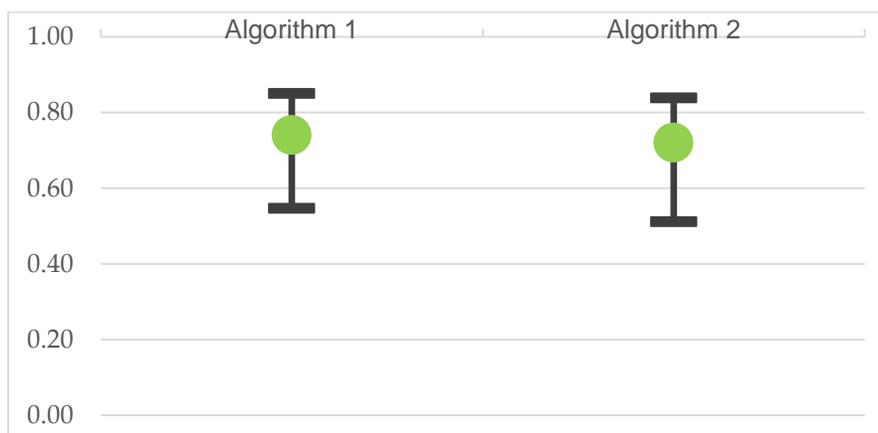
\bar{r} = the average correlation

We calculated the Cronbach Alpha for the two algorithm variations discussed previously.

Figure 7 below presents the Cronbach's Alpha and the 90% confidence intervals for the two NTG ratio algorithm variations for the CY2018 Custom Program. Overall, Cronbach's Alpha values for CY2018 are quite high, 0.74 for Algorithm 1 and 0.72 for Algorithm 2.

Note that the confidence intervals around Cronbach's Alpha are expected to be quite large due to the relatively small sample size. In CY2018, the Cronbach's Alpha results and confidence intervals for the two algorithm variants are nearly identical. Most likely this is because the formula leads to higher values when the inter-item correlations are higher (as was the case in CY2018).

Figure 6: CY2018 Custom Program Cronbach's Alpha and 90% Confidence Intervals for the Two Algorithm Variations (N=17)



Source: Evaluation team analysis

APPENDIX: CUSTOM PROGRAM NTG HISTORY

	Business Custom Incentive
EPY1	NTG 0.72 Free-Ridership 28% Spillover 0% Method: Customer self-reports. 24 surveys completed from a population of 88.
EPY2	NTG 0.76 Free-Ridership 24% Spillover 0% Method: Customer self-reports. 20 surveys completed from a population of 345.
EPY3	NTG 0.56 for kWh and 0.46 for kW Free-Ridership 44% Spillover 0% Method: Customer self-reports. 67 surveys completed from a population of 887.
EPY4	Deemed using PY2 = 0.76 PY4 Research NTG 0.61 for kWh and 0.64 for kW Free-Ridership 39% Spillover 0% Method: Customer self-reports. 63 surveys completed from a population of 367.
EPY5	SAG Consensus: <ul style="list-style-type: none"> • 0.56
EPY6	SAG Consensus: <ul style="list-style-type: none"> • 0.61 kWh (deemed by SAG for PY6) • 0.64 kW (deemed by SAG for PY6) Values for kWh and kW are derived from PY4 evaluation research results and are based on the SAG-approved values.
EPY7	Custom NTG: 0.64 Free-Ridership: 0.36 Participants Spillover: Negligible Nonparticipants Spillover: Negligible Data Centers NTG: 0.48 Free-Ridership 0.52 Participants Spillover: Negligible Nonparticipants Spillover: Negligible Source: Participant self-report telephone survey. The spillover effects were examined in this evaluation and their magnitude was found to be quite small as discussed below in the spillover section. Therefore, a quantification of spillover was not included in the calculation of NTG ratio for EPY5. Notes: In PY5, Data Centers was combined with Custom, while in PY6, Data Centers was managed separately from with Custom. Interviews were completed with 5 of 11 Data Center projects.

	Business Custom Incentive
EPY8	<p>Recommendation (based upon PY6 research): Custom NTG: 0.67 Custom Free Ridership: 0.33 Custom Spillover: 0.005</p> <p>Custom: The above values are from the PY6 research results. NTG research methods in PY6 consisted of participant and trade allies survey data collection and analysis (n=32). NTG research methods in PY6 combined participant and service provider survey results.</p> <p>The existence of participant spillover was examined in PY6 but no significant spillover activity was reported by participants, and, therefore, quantification was not warranted.</p>
EPY9	<p>Custom NTG: 0.58 Custom Free Ridership: 0.42 Custom Spillover: Negligible</p> <p>NTG Research Source: Free-Ridership: PY7 Participant and vendor research Spillover: PY7 Participant self-report data</p>
CY2019	<p>Custom NTG kWh: 0.58 Custom NTG kW: 0.70 Custom Free Ridership kWh: 0.42 Custom Free Ridership kW: 0.30 Custom Spillover: Negligible</p> <p>NTG Research Source: Free-Ridership: PY7 Participant and vendor research Spillover: PY7 Participant self-report data</p> <p>The evaluation team performed telephone surveys in PY8, but the analysis will be performed and combined with PY9 findings.</p>

Source:

http://ilsagfiles.org/SAG_files/NTG/2019_NTG_Meetings/Corrected_NTG_Values/ComEd_NTG_History_and_CY2019_Recommendations_Aerator_and_Showerhead_Correction_2019-04-12.pdf